

REMARKS

Claims 1, 2, 7-11, 13 and 15-26 are pending in the present application for further prosecution. Applicants submit arguments for overcoming the rejections based on the prior art of record. Accordingly, Applicants respectfully submit that claims 1, 2, 7-11, 13 and 15-26 are in condition for allowance.

I. Claim Rejection - 35 USC §103(a)

- A. *In the FINAL Office Action dated March 4, 2011, claims 1, 2, 7-11, 13, 17-23 and 26 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,619,537 B1 issued to Zhang et al. in view of in view of JP 03-079734 A (Fukuda) and further in view of JP 10-168532 A (Honjo et al.).*

In the FINAL Office Action, Zhang et al. is relied upon as disclosing all the limitations of independent claims 1 and 17 of the present application with the except that Zhang et al. fails to disclose a backing plate made of the same or similar composition required by claims 1 and 17 of the present application, as filed. For this reason, Fukuda and Honjo et al. are cited. Fukuda is stated as disclosing a composition including Cu, Cr, Sn, Mg and Si. However, it is readily admitted that Fukuda fails to disclose a composition having 2-4wt% of nickel (Ni), or the alternative, 0.2 to 0.5wt% of Be. Honjo et al. is stated as disclosing a composition with Cu, Sn, Ni, Si, Cr and Mg. From this, it is concluded in the FINAL Office Action that “it would have been obvious to one of ordinary skill in the art to replace Sn of Fukuda with Ni of Honjo et al.” to arrive at the claimed composition and that “it would have been obvious to one of ordinary skill in the art to use the specified copper alloy weight percentages taught by Fukuda” as modified by Honjo et al. for the backing plate of the Zhang et al. patent. Thus, the above listed claims of the present applicant are stated as being obvious in view of these three references.

It is clear that the above stated rejection is based on obviousness under 35 USC §103(a) (and not anticipation under 35 USC §102(b)). Thus, Applicants respectfully submit that teachings provided by a references to one of ordinary skill in the art that are relevant under §103(a) include teachings that “teach away” from claimed subject matter. For example, if a reference teaches away from limitations recited in the claims, then the reference directs one of ordinary skill in the art away from the claimed invention and it cannot be said that the claimed invention would then have been obvious to one of ordinary skill in the art strictly following the teachings of the prior art references.

“Teaching away” is the antithesis of the art suggesting that the person of ordinary skill in the art go in the claimed direction. Essentially, “teaching away” is a per se demonstration of lack of obviousness.

The primary reference of the §103(a) rejection, Zhang et al., discloses a bonding surface (18) of a copper alloy backing plate (16) diffusion-bonded to a back face (14) of a high purity copper alloy sputtering surface via an intervening layer (20). For example, see the following sections of Zhang et al.:

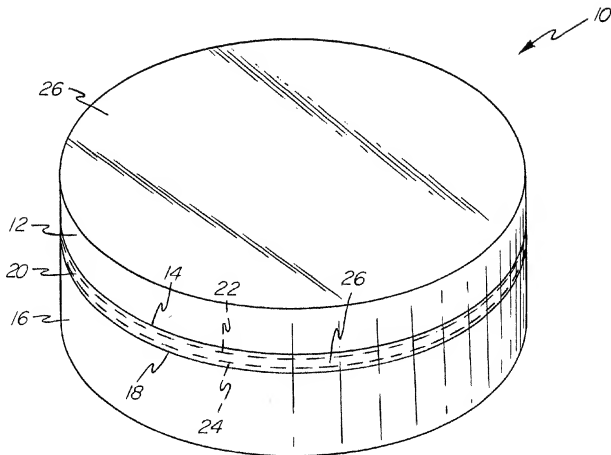
ABSTRACT - “A sputter target assembly including a high purity copper sputter target diffusion bonded to a backing plate, preferably composed of either aluminum, aluminum alloy, aluminum matrix composite materials, copper, or copper alloy, *and a Ni-alloy interlayer*, preferably composed of Ni-V, Ni-Ti, Ni-Cr, or Ni-Si, *located between and joining the target and backing plate*, and a method for making the assembly. The method of making involves *depositing (e.g., electroplating, sputtering, plasma spraying) the interlayer on a mating surface of either the sputter target or backing plate* and pressing, such as hot isostatically pressing, the sputter target and backing plate together along mating surfaces so as to form a diffusion bonded sputter target assembly.”

COLUMN 2, LINE 63, TO COLUMN 3, LINE 5 – “The present invention provides a sputter target/backing plate assembly comprising a sputter target composed of copper and alloys thereof, most preferably high-purity copper, a backing plate composed of a metallic material, preferably aluminum, aluminum alloy, aluminum matrix composite materials, copper, or copper alloys, *and an interlayer between the target and backing plate wherein the interlayer, target, and backing plate are diffusion bonded together.* The interlayer is composed of a Ni-alloy, preferably Ni-V, Ni-Ti, Ni-Cr, and Ni-Si.”

COLUMN 4, LINES 33-39 – “Referring to FIG. 1, a sputter target assembly 10 includes a target 12 defining a first mating surface 14, a backing plate 16 defining a second mating surface 18, *and an interlayer 20 between the first and second mating surfaces 14, 18 wherein the interlayer 20, target 12, and backing plate 16 are diffusion bonded together.*”

FIG. 1 -

FIG -1



Zhang et al. also disclose a sputtering target and backing plate that are directly diffusion bonded together without an intervening layer (20). For instance, column 1, lines 57-65, states as follows:

“With respect to sputter target assemblies used during sputtering processes, more specifically to copper target assemblies, *these assemblies historically have been made by bonding a high-purity Cu plate to a lightweight and highly heat conductive backing plate*, such as Al, aluminum alloy, or aluminum matrix composite materials. Additionally, Cu targets may be bonded to a Cu, or Cu alloy, backing plate in forming target assemblies. Two methods used in bonding Cu targets are solder bonding and diffusion bonding.”

However, Zhang et al. provide a clear teaching to one of ordinary skill in the art that teaches away from “these assemblies”. For example, see column 2, lines 9-24, which states, as follows:

“However, *the bond between a Cu target and backing plates formed of various metallic materials may produce very brittle intermetallic compounds during the bonding process resulting in a weak bond*. Specifically, the bond between Cu and Al produced by diffusion bonding is *extremely weak* due to the fact that Cu and Al form several *very brittle intermetallic compounds during the bonding process*. These *brittle interphases tend to reduce the mechanical load necessary to initiate failure during tensile testing*, for example, copper and aluminum are capable of forming a low temperature intermetallic phase incapable of withstanding a tensile stress greater than approximately 2 ksi (1.4×10^7 N/m²).

To eliminate this intermetallic interphase and improve bond strength, it is necessary to use an interlayer, such as Ni or Ti, between the target and backing plate.”

Accordingly, Zhang et al. clearly teach the direct bonding of a sputtering target to a backing plate will create a brittle intermediate phase at the bonded surfaces that greatly deteriorates bonding strength. Thus, Zhang et al. direct one of ordinary skill in the art not to directly diffusion bond the sputtering target to the backing plate; rather, Zhang et al. direct one of ordinary skill in the art to bond the sputtering target to the backing plate via an intervening layer or interlayer (20) of Ni or Ti. Zhang et al. teach to one of ordinary skill in the art that the intervening layer (20) is “necessary” (not optional).

Independent claim 1 of the present application requires “a copper or copper alloy target having a back face and a copper alloy backing plate bonded directly to said back face” and independent claim 17 of the present application requires “a copper or copper alloy target diffusion bonded directly to a copper alloy backing plate”. While Zhang et al. disclose a “historical” assembly in which a sputtering target is directly bonded to a backing plate in column 1, lines 57-65, of the Zhang et al. patent, Zhang et al. clearly also provide a teaching to one of ordinary skill in the art not to directly bond a sputtering target to a backing plate as with the “historical” assembly. Rather, Zhang et al. clearly require the use of an “interlayer” therebetween to prevent brittle intermetallic compounds from forming as a result of bonding and clearly state that the interlayer is “necessary”.

Applicants respectfully submit that it is an error not to consider the clear teaching-away provided by the Zhang et al. reference. One of ordinary skill in the art following the teachings of Zhang et al. would not directly bond the sputtering target to the backing plate. There is absolutely no motivation provided by the teachings of Zhang et al. to directly bond a sputtering target to a backing plate. This rejection is made under §103(a) and the above “teaching away” must be considered. Applicants respectfully submit that when this clear teaching away of the claimed invention is properly considered, the above stated rejection cannot stand and should be withdrawn.

Accordingly, Applicants respectfully request that the above referenced rejection be withdrawn since claims 1, 2, 7-11, 13, 17-23 and 26 are patentable over Zhang et al. in view of Fukuda and further in view of Honjo et al. because the primary reference, Zhang et al., teaches away from the subject matter required by the claims of the present application.

As an additional reason as to why the subject matter claimed in the present application would not be obvious to one of ordinary skill in the art, Fukuda clearly require a “specified

amount of Cr as an essential component” and Honjo et al. clearly require Co and P as essential components. It should be noted that Fukuda clearly does not list Co and P as possible components for its alloy. Thus, Applicants respectfully submit that one of ordinary skill in the art would not find it obvious to combine these references based on the differences in the “essential components” of the different compositions. In the alternative, if one of ordinary skill in the art were to modify the composition of Fukuda based on Honjo et al., one of ordinary skill in the art would certainly include Co and P because these are components clearly taught as being essential by the Honjo et al. reference. Thus, Applicants respectfully submit that the composition required by the claims of the present application would not have been obvious to one of ordinary skill in the art at the time the present invention was made by modifying Fukuda in view of the Honjo et al. reference to arrive at a composition.

B. In the FINAL Office Action dated March 4, 2011, claims 15, 16 and 24 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,619,537 B1 issued to Zhang et al. in view of JP 01-180976 A of Ishikura.

Independent claim 15 requires “a copper or copper alloy target having a back face and a backing plate diffusion bonded directly to said back face of said target, said backing plate being made of a low beryllium copper alloy containing 0.2 to 0.5wt% of Be.”

As discussed above, Zhang et al. teaches away from direct bonding of a backing plate to a target; rather, Zhang et al. direct one of ordinary skill in the art that it is “necessary” to use an interlayer therebetween.

It is clear that the above stated rejection is based on obviousness under 35 USC §103(a) (and not anticipation under 35 USC §102(b)). Thus, the teachings provided by a references to one of ordinary skill in the art that are relevant under §103(a) include teachings that teach away from claimed subject matter. For example, if a reference teaches away from limitations recited

in the claims, then the reference directs one of ordinary skill in the art away from the claimed invention and it cannot be said that the claimed invention would then have been obvious to one of ordinary skill in the art following the teachings of the prior art references as required to make the rejection in the first place.

“Teaching away” is the antithesis of the art suggesting that the person of ordinary skill in the art go in the claimed direction. Essentially, “teaching away” is a per se demonstration of lack of obviousness.

The primary reference of the §103(a) rejection, Zhang et al., discloses a bonding surface (18) of a copper alloy backing plate (16) diffusion-bonded to a back face (14) of a high purity copper alloy sputtering surface via an intervening layer (20). For example, see the sections of Zhang et al. quoted above.

Zhang et al. also disclose a sputtering target and backing plate that are directly diffusion bonded together without an intervening layer (20). For instance, column 1, lines 57-65, states as follows:

“With respect to sputter target assemblies used during sputtering processes, more specifically to copper target assemblies, *these assemblies historically have been made by bonding a high-purity Cu plate to a lightweight and highly heat conductive backing plate*, such as Al, aluminum alloy, or aluminum matrix composite materials. Additionally, Cu targets may be bonded to a Cu, or Cu alloy, backing plate in forming target assemblies. Two methods used in bonding Cu targets are solder bonding and diffusion bonding.”

However, Zhang et al. clearly provide a disclosure to one of ordinary skill in the art that teaches away from “these assemblies”. For example, see column 2, lines 9-24, which states, as follows:

“However, *the bond between a Cu target and backing plates formed of various metallic materials may produce very brittle intermetallic compounds during the bonding process resulting in a weak bond*. Specifically, the bond between Cu and Al produced by diffusion bonding is *extremely weak* due to the fact that Cu and Al form several *very brittle intermetallic compounds during the*

bonding process. These brittle interphases tend to reduce the mechanical load necessary to initiate failure during tensile testing, for example, copper and aluminum are capable of forming a low temperature intermetallic phase incapable of withstanding a tensile stress greater than approximately 2 ksi (1.4×10^7 N/m²).

To eliminate this intermetallic interphase and improve bond strength, it is necessary to use an interlayer, such as Ni or Ti, between the target and backing plate.”

Accordingly, Zhang et al. clearly teach that the direct bonding of a sputtering target to a backing plate will create a brittle intermediate phase at the bonded surfaces that greatly deteriorates bonding strength. Thus, Zhang et al. direct one of ordinary skill in the art not to directly diffusion bond the sputtering target to the backing plate; rather, Zhang et al. teach one of ordinary skill in the art that it is necessary to bond the sputtering target to the backing plate via an intervening layer of Ni or Ti (20). Zhang et al. teach to one of ordinary skill in the art that the intervening layer (20) is “necessary” and essential.

Applicants respectfully submit that it is an error not to consider the clear teaching-away provided by the Zhang et al. reference. One of ordinary skill in the art following the teachings of Zhang et al. would not directly bond the sputtering target to the backing plate. There is absolutely no motivation provided by the teachings of Zhang et al. to directly bond a sputtering target to a backing plate. This rejection is made under §103(a) and the above “teaching away” must be considered. Applicants respectfully submit that when this clear teaching away of the claimed invention is properly considered, the above stated rejection cannot stand and should be withdrawn.

Accordingly, Applicants respectfully request that the above referenced rejection be withdrawn since claims 15, 16 and 24 are patentable over Zhang et al. in view of Ishikawa because the primary reference, Zhang et al., teaches away from the subject matter required by the claims of the present application.

C. *In the FINAL Office Action dated March 4, 2011, claim 25 is rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,619,537 B1 issued to Zhang et al. in view of JP 01-180976 A of Ishikura and further in view of JP 10-168532 A (Honjo et al.).*

Applicants respectfully submit that claim 25 is patentable over the cited references for the same reasons discussed above that independent claim 15 is patentable over Zhang et al. in view of Ishikura.

Applicants submit the following additional reason as to why the subject matter of claim 25 would not be obvious based on the above references.

Ishikura discloses a copper alloy containing 100-3000ppm in total of one or more of Zn, In, Mn, Sb, Be, Ca, Cr, Te, Y, Nb, Mo, Ta and Sn.

Honjo et al. disclose a copper alloy containing 0.01-1.0wt% of Co, 0.005-0.5wt% of P, and 0.001-1.0wt% in total of one or more of Zn, Sn, Ni, Fe, Pb, Si, Al, Zr, Cr, Ti, In, Mg, and Ag. Honjo et al. states that this alloy will possess superior mechanical workability, thermal conductivity, heat resistance, and brazing properties. More specifically, Honjo et al. discloses that “by the addition of Co, its thermal conductivity is increased without reducing the electric conductivity of copper, its deformation caused by thermal strains is reduced, and its machinability and brazability are improved, and by the addition of P, intermetallic compounds with Co are formed to improve its strength and thermal resistance.” Thus, the addition of Co and P are clearly an essential requirement of the Honjo et al. reference, not the addition of Ni.

Accordingly, one of ordinary skill in the art following the teachings of Honjo et al. and desiring superior mechanical workability, thermal conductivity, heat resistance, and brazing properties would clearly add Co and P to the composition of Ishikura. However, if the additive elements of Zn, Sn, Ni, Fe, Pb, Si, Al, Zr, Cr, Ti, In, Mg, and Ag taught by Honjo et al. were added to a Cu-Be alloy according to Ishikura, it is completely unknown to one of ordinary skill

in the art whether or not superior mechanical workability, thermal conductivity, heat resistance, and brazing properties would be provided as in the case of adding Co and P. If improvements of these properties were desired, it is clear that one of ordinary skill in the art would have added both Co and P. Accordingly, there is no common sense motivation for modifying the composition disclosed by Ishikura as suggested in the FINAL Office Action.

Accordingly, Applicants respectfully request that the above referenced rejection be withdrawn from claim 25 which does not include a content of P (based on the addition of percentages).

II. Conclusion

In view of the above amendments and remarks, Applicants respectfully submit that the claim rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Response to our deposit account no. 08-3040.

Respectfully submitted,
Howson & Howson LLP
Attorneys for Applicants

By /William Bak/
William Bak
Reg. No. 37,277
501 Office Center Drive
Suite 210
Fort Washington, PA 19034
(215) 540-9216